Opto-magnonic crystals: optical manipulation of spin waves

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Propositions

accompanying the dissertation

Optomagnonic Crystals: Optical Manipulation of Spin Waves

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1. Magnetic state of a material can be altered by structural deformations, for example, by acoustic waves. The excited magnetoelastic waves perturb the magnetic polarization of material, sharing the same wavevector as the underlying acoustic waves.

2. By depositing pulsed-laser energy into a film, transient grating technique can be applied to excite acoustic waves. Crossing two laser beams creates an interference pattern on samples and lunches a narrowband acoustic response which can be coupled to the magnetization.

3. By scrutinizing the experimental details, the parametric oscillation can be observed as the part of features of magnetoelastic waves, encouraging more possibilities to control over the widely tunable, narrowband of wave profiles.

4. The laterally varying magnetic texture is phase-locked with elastic waves.

5. The periodic impulsive heating, which is generated by the transient grating excitation, periodically modulates the magnetic landscape of material.

6. Putting 4 and 5 together, the emergent bandstructure of magnonic crystal was discovered as the primary result of the thesis.

7. Similar approaches can be extended to otherwise systems. Spin waves can be optically excited in a nanowire system, having a sound understanding of magnetoelastically excited spin waves.

8. Systematically exploring all possible degree of freedoms would bring a solution to an unsolved problem.

9. Tackling an experimental anomaly could change physics, and a new exciting technique will be developed.